

## Gastroenterology and Hepatology Research Output in the 20<sup>th</sup> Century - A Bibliometric Study

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**Conflict-of-interest statement:** The authors declare that there is no conflict of interest regarding the publication of this paper.

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Received: April 5, 2019

Revised: May 18, 2019

Accepted: May 21, 2019

Published online: June 21, 2019

### ABSTRACT

**OBJECTIVE:** During the last 2 decades, a distinguished studies have been produced in the area of biomedical research assessment. Among the poorly studied fields is the gastroenterology and hepatology. In this study, we aim to assess the status of gastroenterology and hepatology research in the 20<sup>th</sup> century (2000-2018), where we will assess the emergence of gastroenterology and

hepatology research in each year, its open access status and countries and journals the research is published in.

**METHODS:** We used Web of Science database to search for articles and reviews published in the field of gastroenterology and hepatology in the years from January 1<sup>st</sup>, 2000 to December 31<sup>st</sup>, 2018. Among the variables we assessed, yearly trend, open access publications, countries, journals, and top cited articles.

**RESULTS:** A total of 203,438 publications were retrieved by our search, of which 66,164 (32.5%) were open access publications. The yearly trend in total publication output showed a steady increase till 2015, followed by a steady decline. For country analyses, Japan has emerged to be the 2<sup>nd</sup> highest country with research output in gastroenterology and hepatology. World Journal of gastroenterology remained to be the highest publishing journal in this field.

**CONCLUSION:** The gastroenterology and hepatology field is rapidly expanding during the last two decades. This study provided an overall assessment of this field, taking the advantage of the advanced field indexing service by Web of Science database.

**Key words:** Gastroenterology; Hepatology; Web of Science; Bibliometry

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Khamees N, Mustafa A, Al-Rashdan R, AbuFarsakh N, Abuazzam F, Alaraj O, Al-Essa M, AlRyalat SA. Gastroenterology and Hepatology Research Output in the 20<sup>th</sup> Century - a Bibliometric Study. *Journal of Gastroenterology and Hepatology Research* 2019; **8(3)**: 2903-2906 Available from: URL: <http://www.ghrnet.org/index.php/joghr/article/view/2554>

### INTRODUCTION

Bibliometric analysis can be defined as the use of statistical methods to analyze a body of literature to reveal historical development<sup>[1]</sup>. Choosing the right database to conduct a bibliometric study is an important step, as each literature database provides different features than others<sup>[2]</sup>. Previous studies have used bibliometric analysis to analyze different medical disciplines, as using it in ophthalmology<sup>[3]</sup>, urology<sup>[4]</sup>, and orthopedics<sup>[5]</sup>.

In regard to analyzing gastroenterology field, previous studies have either analyzed gastroenterology and hepatology research in certain journals<sup>[6-9]</sup>, or gastroenterology and hepatology research from specific countries<sup>[10-14]</sup>. Up to our knowledge, none of the previous studies investigated the status of gastroenterology and hepatology research worldwide. In this study, we aim to assess the status of gastroenterology and hepatology research in the 20<sup>th</sup> century (2000-2018), where we will assess the emergence of gastroenterology and hepatology research in each year, its open access status and countries and journals the research is published in. Moreover, we will assess the top 10 publications with the highest scholarly output, and the top 10 publications with the highest number of citations.

## METHODOLOGY

### Search strategy

We used Web of Science database to search for articles and reviews published in the field of gastroenterology and hepatology in the years from January 1<sup>st</sup>, 2000 to December 31<sup>st</sup>, 2018. We applied the following search criteria: (1) Year published (2000-2018); (2) Web of science category (Gastroenterology hepatology); (3) Document type (Article or review).

### The following search query resulted

Published: (2000-2018) And Web Of Science Categories: ( Gastroenterology Hepatology ) And Document Types: ( Article Or Review ).

### Outcome measures

(1) Number of open access publications, which is given if the publication is published as an open access by the journal (i.e. gold open access), or if the author archived the research in an open access repository (i.e. green open access). (2) Yearly trend, which provides the number of publication each year. (3) Countries and organizations that the authors who published the work were affiliated with. (4) Journals that the publications were published in. (4) Co-categories, which represent the field that the publication is categorized in, in addition to the field of gastroenterology and hepatology. (4) Top cited publications, publications that received the highest number of citations in web of science publications. (5) Top 10 journals, journals that published the highest number of publications in the period from 2000 to 2018.

## RESULTS

A total of 203,438 publications were retrieved by our search, of which 66,164 (32.5%) were open access publications. The yearly trend in total publication output has almost steadily increased from 2000 with 7,630 publications till 2015 where it peaked to reach 14,089 publications, then a steady decline till 2018, with 12,389 publications (Figure 1). For open access, the percentage of open access publications also peaked in 2015 as almost 48.3% of all publications were open access (Figure 2).

The top five Co-categories were Surgery 34,941 (17.2%), Pharmacology and pharmacy 5,403 (2.7%), Nutrition dietetics 5,015 (2.5%), Pediatrics 4,865 (2.4%), and Physiology 4,863 (2.4%), other fields contributed to less than 2% of the total output.

For countries, almost 27.9% of all publications were from USA (56,813 publications), followed by Japan 26,834 (13.2%), China 20,039 (9.9%), Germany 15,568 (7.7%), and Italy 14,241 (7.0%). Mayo clinic is the organization with the highest number of publications 5,582 (2.7%), followed by University of California

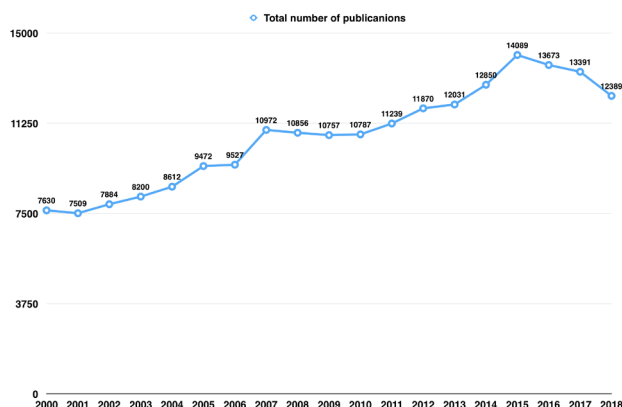


Figure 1 The yearly trend in total publication output in gastroenterology and hepatology.

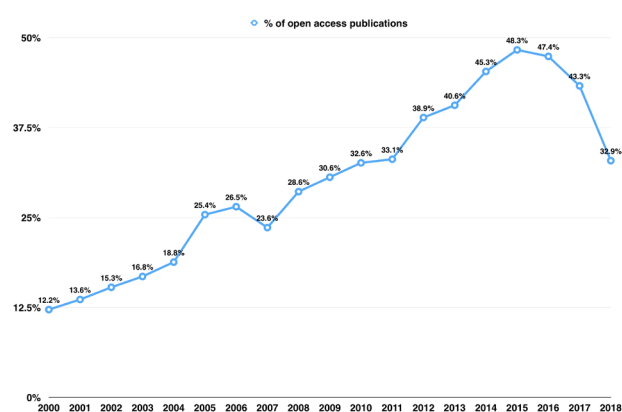


Figure 2 The yearly trend in percentage of open access publications for gastroenterology and hepatology research.

5,361 (2.6%), Harvard university 4,568 (2.2%), Assistance publique -- Hôpitaux de Paris (AP-HP) 4,507 (2.2%), and Inserm 3,907 (1.9%).

The journal with the highest number of publications was World Journal of Gastroenterology with 17,201 (8.5%), followed by Digestive Diseases and Sciences with 7,757 (3.8%), Hepatology 6,664 (3.3%), Hepato-Gastroenterology 6,560 (3.2%), and Gastroenterology with 6,045 (3.0%) publications. Table (1) detail the top 10 journals in term of publication output and their respective impact factor. The top cited article in our search was on the management of hepatocellular carcinoma, which was published in Hepatology journal in 2005. Table 2 shows the top 10 publications with the highest number of citations.

## DISCUSSION

During the years from 2000 to 2018, the total number of gastroenterology and hepatology publications has increased from 7,630 to 12,389 publications, an increase by 62.4%. Of the total publications retrieved by our search, 32.5% were open access, a percentage that has also increased from 12.2% in 2000 to 32.9% in 2018.

The highest number of publications and the highest open access percentage was in 2015. USA produced almost 27.9% of all publications worldwide, with the US-based organization; Mayo clinic, being the number-one contributor to the total publications with 5,582 publications (2.7%). The journal with the highest number of publications is World Journal of Gastroenterology with 17,201 publications (8.5%), and the article entitled “Management of hepatocellular carcinoma” published in 2005, is the most cited paper

**Table 1** The top 10 journals in term of publication output and their respective impact factor.

Journal	Impact factor	Year established	Publication output	% from total output
World journal of gastroenterology	3.5	1995	17,201	8.46%
Digestive diseases and sciences	2.82	1979	7,757	3.81%
Hepatology	14.1	1981	6,664	3.28%
Hepato gastroenterology	-	1980	6,560	3.23%
Gastroenterology	10.9	1945	6,045	2.97%
American journal of gastroenterology	10.2	1953	5,434	2.67%
Alimentary pharmacology therapeutics	7.4	1987	5,403	2.66%
Gastrointestinal endoscopy	7.2	1965	5,397	2.65%
Journal of gastroenterology and hepatology	2.1	1986	5,348	2.63%
Journal of hepatology	15	1985	4,929	2.42%

**Table 2** The top 10 publications with the highest number of citations.

Title	Journal	Times cited	Published year	Open access status
Management of hepatocellular carcinoma	Hepatology	4,036	2005	Yes
Design and validation of a histological scoring system for nonalcoholic fatty liver disease	Hepatology	3,950	2005	Yes
Hepatocellular carcinoma: Epidemiology and molecular carcinogenesis	Gastroenterology	3,139	2007	Yes
Clinical management of hepatocellular carcinoma. Conclusions of the Barcelona-2000 EASL Conference	Journal of Hepatology	3,084	2001	Yes
Functional bowel disorders	Gastroenterology	2,549	2006	Yes
A model to predict survival in patients with end-stage liver disease	Hepatology	2,448	2001	Yes
Diagnosis, Management, and Treatment of Hepatitis C: An Update	Hepatology	2,182	2009	Yes
Prevalence of hepatic steatosis in an urban population in the United States: Impact of ethnicity	Hepatology	2,074	2004	Yes
A simple noninvasive index can predict both significant fibrosis and cirrhosis in patients with chronic hepatitis C	Hepatology	1,946	2003	Yes
Systematic review of randomized trials for unresectable hepatocellular carcinoma: Chemoembolization improves survival	Hepatology	1,830	2003	Yes

with 4,036 citations.

Gastroenterology and hepatology research was found to represent about 8% of world biomedical research<sup>[11]</sup>. A previous study that analyzed gastroenterology and hepatology research published only in gastroenterology and hepatology journals using Medline found that the total number has increased from 9,447 in 2001 to 13,340 in 2007, with a total of 81,561 publications over that period<sup>[6]</sup>. A previous report analyzed the publications in the top three gastroenterology and hepatology journals in terms of impact factor, and found an increase in both, total number of publications and in the percentage of international publications, i.e. publications from countries other than journal's country, from 31% in 1970 to 67.6% in 2005<sup>[7]</sup>.

Maeda et al. analyzed Japan's gastroenterology and hepatology research using Medline in 2003, and found that USA and UK are the top two publishing countries, while Japan ranked the third<sup>[10]</sup>. In our study, Japan is the second country in gastroenterology and hepatology research production. This growth in Japan's contribution to this field might be related to a finding by a previous study that the number of publications in a field is related to the mortality rate attributed to that field<sup>[11]</sup>. A previous study proposed that economic factors in Greece might play a role in number of gastroenterology and hepatology research, and found that the economic recession in Greece resulted in reduction in research output<sup>[12]</sup>.

In concordance with our study, a previous Medline analysis of gastroenterology and hepatology journals found that World Journal of Gastroenterology has the highest number of publications, however it ranked Hepato-Gastroenterology and Gastrointestinal Endoscopy as the second<sup>[6]</sup>. An analysis of research by World Journal of Gastroenterology found an increase in Medline publications by around 640% from 2001 to 2007<sup>[8]</sup>. An analysis of the top 100

gastroenterology and hepatology publications in regard to citations done in 2013 without restricting the duration of search to a specific duration, as in our methodology, found that most of the top 10 publications were published by general medicine journals, e.g. New England Journal of Medicine and Lancet, with most of them were published before the year 2000<sup>[15]</sup>.

While this study presents a new analysis of the field of gastroenterology and hepatology using Web of Science database, a database that provides the ability to analyze a field through its advanced field-specific indexing functions, most of previous studies used Medline database to do the bibliometric analysis related to gastroenterology and hepatology field, which may present a challenge to compare the present study's results with previous counterparts.

## CONCLUSION

The gastroenterology and hepatology field is rapidly expanding during the last two decades, with the total number of publications peaked on 2015. Although the highest output journal remained World Journal of Gastroenterology, other journal are emerging in the top 10 list. Japan is the country with the highest growth in this field.

### Author's contribution

NK, AM, RA, NA, FA, OA, MA: authors made substantial contributions to conception and design, acquisition of data. SSA: analysis and interpretation of data. NK, AM, RA, NA, FA, OA, MA, and SAA: drafting the article or revising it critically for important intellectual content; and all authors made substantial contributions to final approval of the version to be published. None of the authors have conflict of interest.

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